

This Drawing is a reproduction of the Original on a reduced scale!

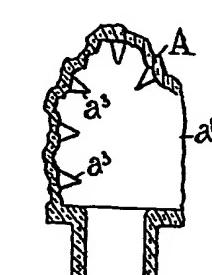


Fig. 2.

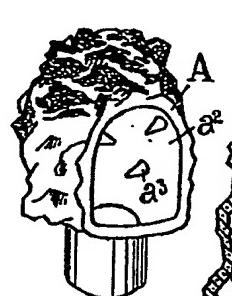


Fig. 1

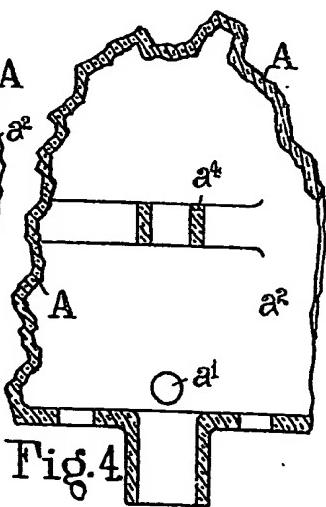


Fig. 4

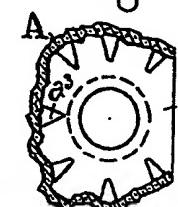


Fig. 3.

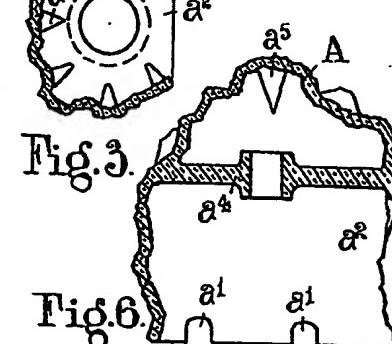


Fig. 6.

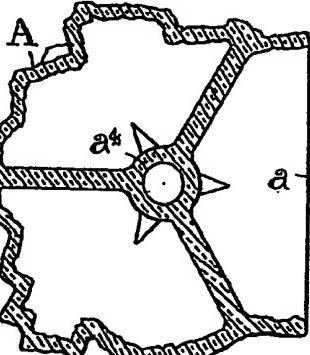


Fig. 5.



Fig. 9.



Fig. 8.

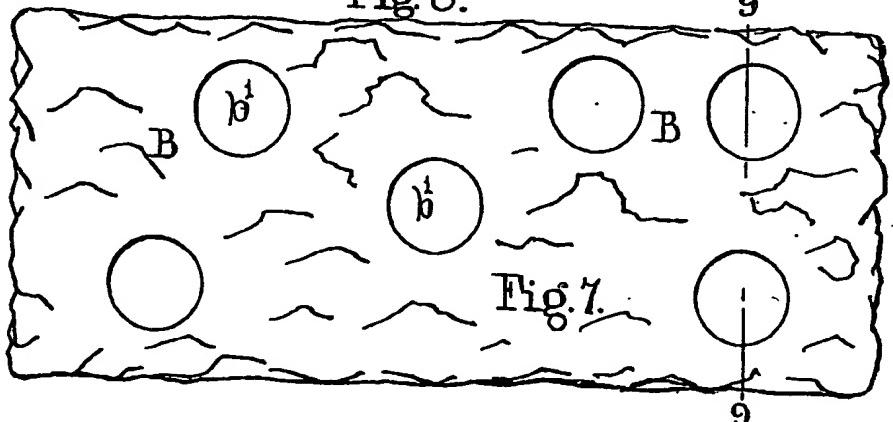
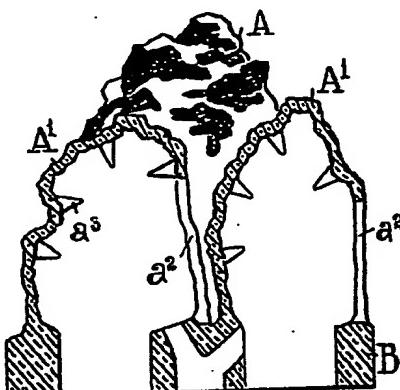


Fig. 7.

SHEET 1



B Fig. 10.

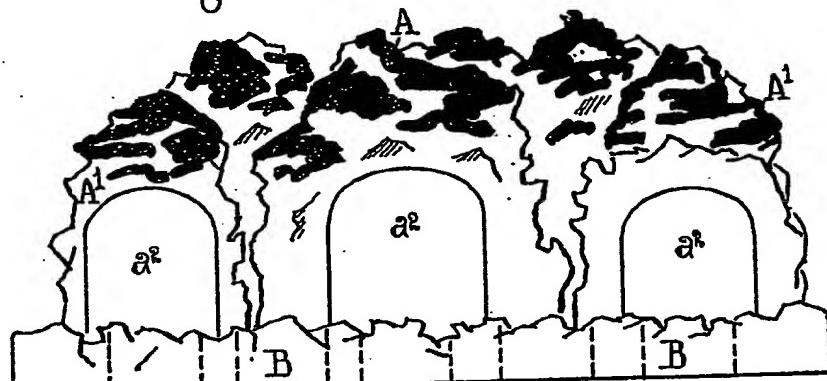


Fig. 11



Fig. 13.

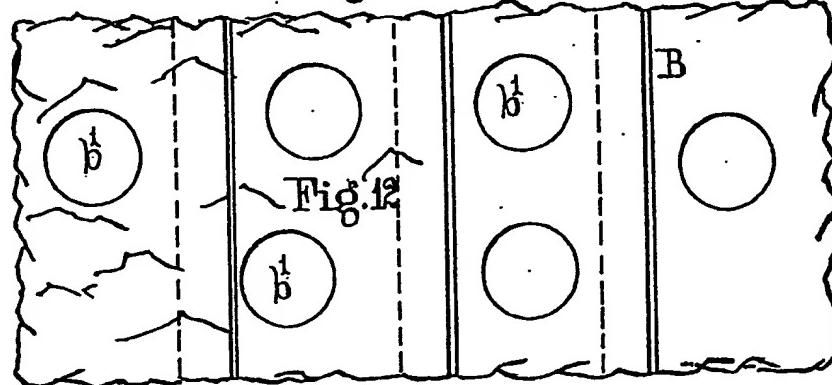
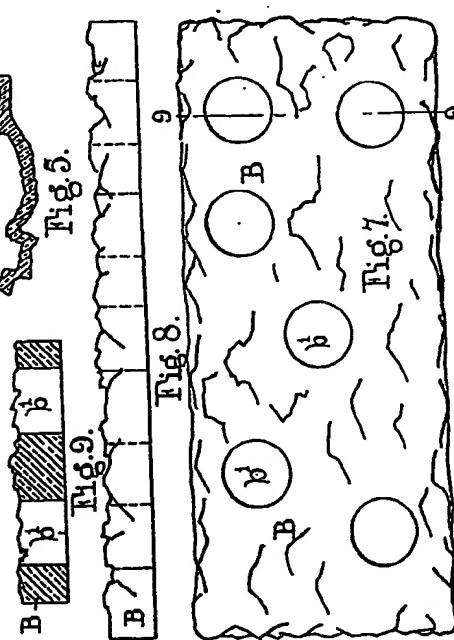
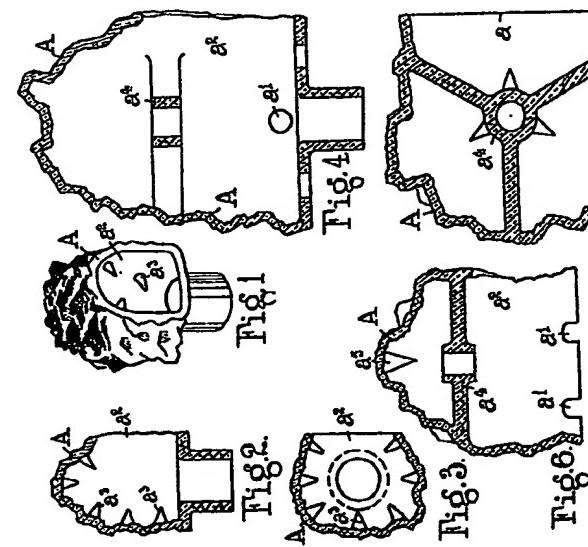
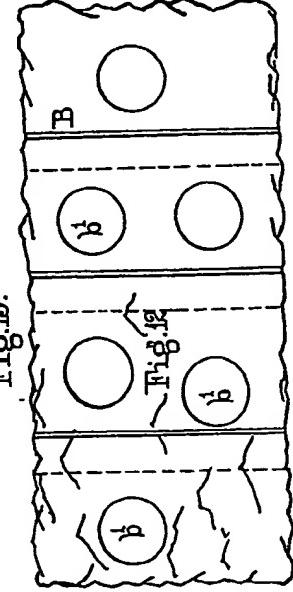
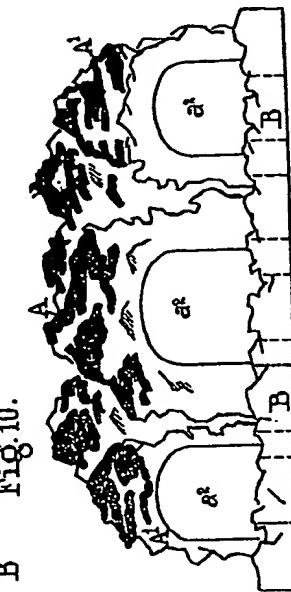
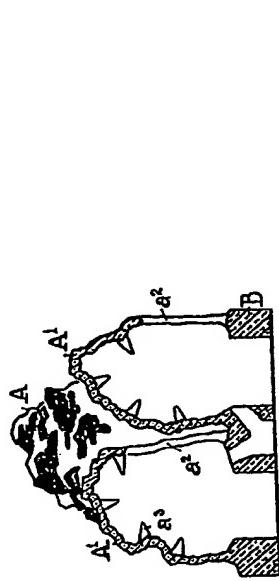


Fig. 12



(This drawing is a reproduction of the original on a reduced scale)



*[This Drawing is a reproduction of the Original on a reduced scale.]*

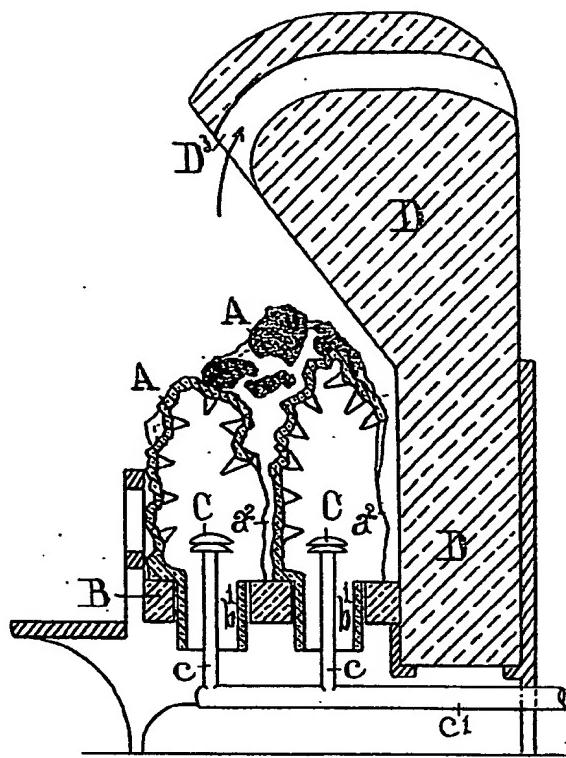


Fig.14.

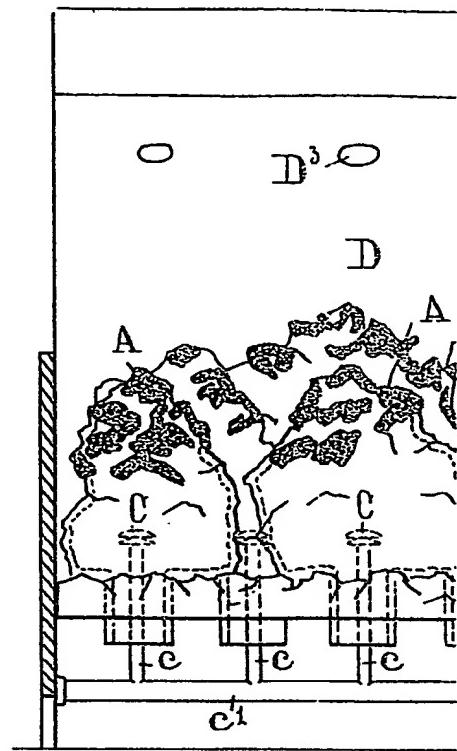


Fig.15.

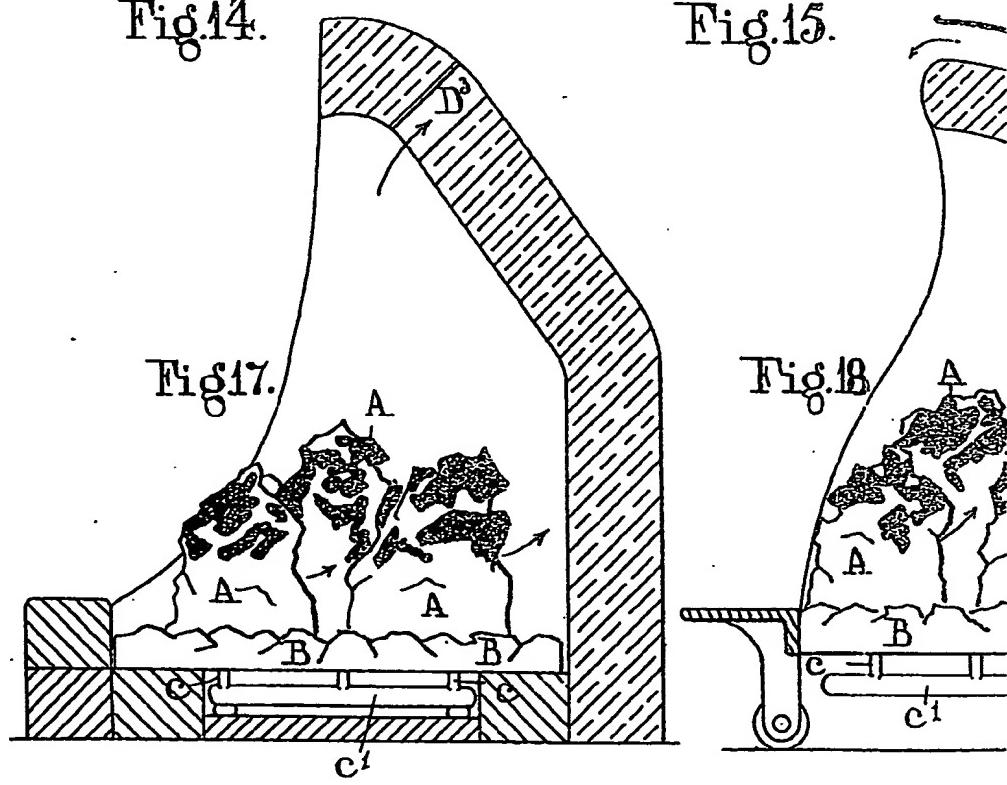


Fig.17.

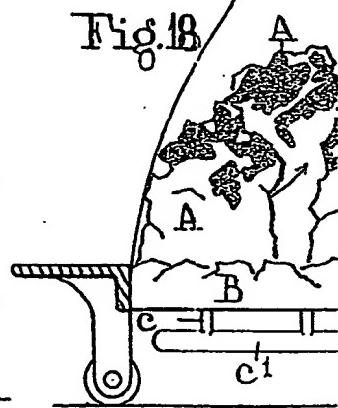
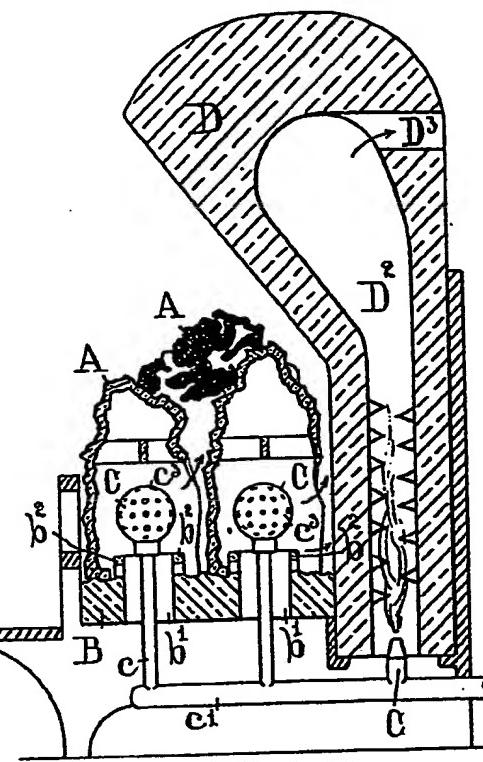
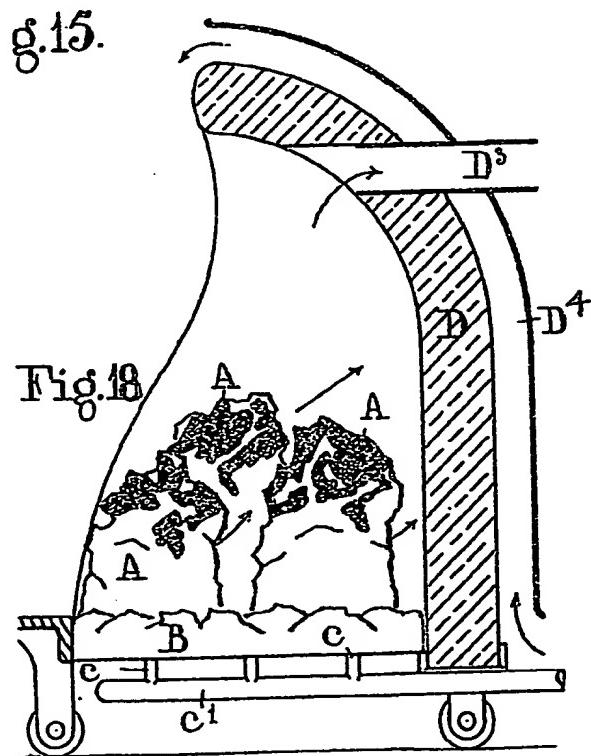
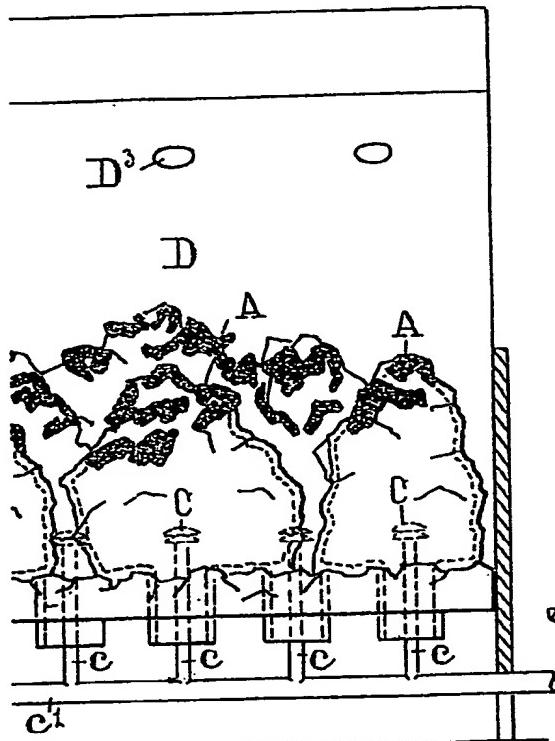


Fig.18.



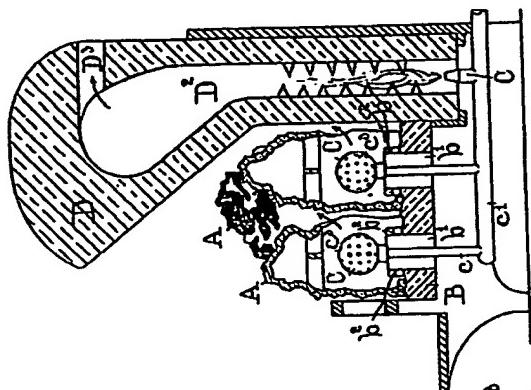


Fig. 14.

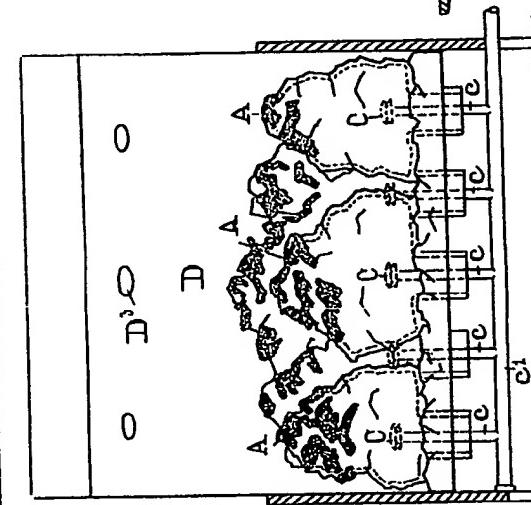


Fig. 15.

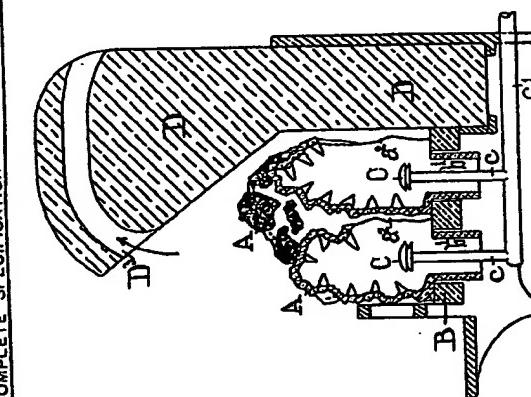


Fig. 16.

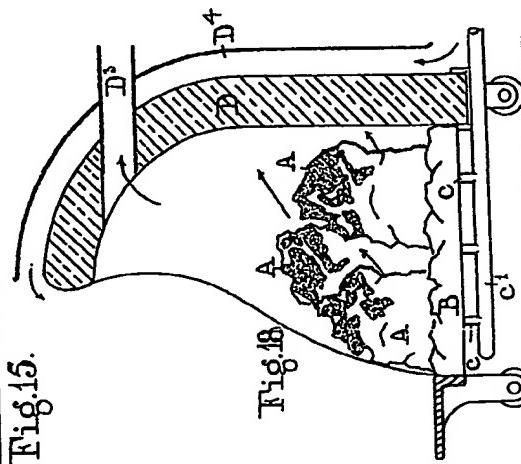


Fig. 17.

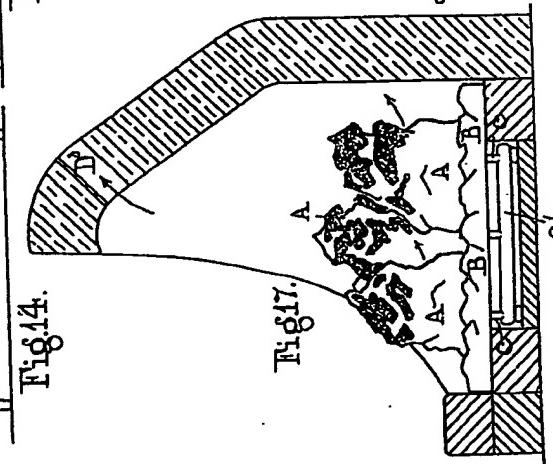


Fig. 18.

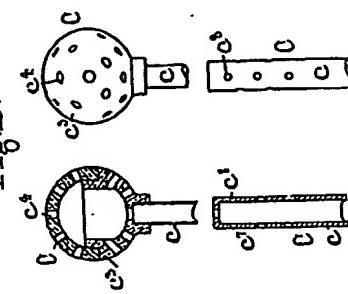


Fig. 19.

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# PATENT SPECIFICATION



Application Date: Dec. 2, 1933. No. 33866/33.

**429,115**

Complete Specification Left: Dec. 29, 1934.

Complete Specification Accepted: May 24, 1935.

## PROVISIONAL SPECIFICATION

### Improvements in Stoves or Heating Apparatus

I, JOHN EDWARD THORNTON of 8, Hill Street, Jersey, Channel Isles, a British Subject, do hereby declare the nature of this invention to be as follows:—

- 5 This invention relates to improvements in stoves or heating apparatus using gas or a gaseous fuel as the source of heat, its object being to produce a stove which, when burning, closely resembles a hot glowing coal fire in appearance and which differs from the many forms of cold flameless imitation fires in that it gives out direct radiant heat which is very similar to that given out by a coal fire.
- 10 According to the invention the construction of the casing or frame of the stove resembles in general features the design of many coal fires of modern type, and comprises a heavy firebrick backplate but formed of that radiant type of fire-clay composition which will give the highest degree of incandescence when heated by gas flames of bunsen type. This
- 15 backplate (hereinafter termed "the fire-back") is provided with sidewings, and may be moulded in such shape that it forms either a curved recess or one with bevelled sides, and is forwardly inclined at its upper part. The shape of this fire-back is so designed that it will throw heat into the room in a horizontal direction, in a downward direction, and in sideways directions towards both sides of the room. The entire fireback structure
- 20 may be lifted clear of the hearth by feet, or it may rest directly upon the hearth, or may be so built that it becomes part of the hearthplate itself, and may be combined with a hearth of the sunken or well
- 25 type.
- This fireback structure may be built directly into the chimney recess of an ordinary fireplace, or it may be built into a metal casing which allows it to be
- 30 placed therein or in any other suitable position; and it may be provided with a ventilating air flue at its rear through which cold air entering at the bottom is warmed in its passage by contact with the
- 35 hot fireclay, and is discharged into the room from an opening or openings near the top as warmed air for additional ventilation and heating purposes.

[Price]

The main feature of the invention is comprised in the apparatus for burning the gas and producing the radiant heat and the appearance of a coal fire, and this portion is hereinafter termed "the fire." 55

This fire comprises three main parts, viz: a radiant-plate, hollow radiant fuel mounted on the radiant-plate, and bunsen burners which pass through and project from the radiant plate into the said hollow radiant fuel. 60

The radiant plate is formed of fireclay of the type having the highest degree of radiance, and it may be in the form of a thick plate the full width and depth of the fire recess. It is moulded with a very irregular front surface to resemble the bottom or inner part of a coal fire that has partly burnt away, and may be supported at the back upon a cast metal backing to give added strength and support, or it may be of sufficient strength alone to require no such backing. 65

This radiant-plate forms the bottom of the stove equivalent to the bottom of a coal grate. 70

Projecting from the surface of the radiant-plate is a series of bunsen burners, with their supply pipes passing through the radiant plate and connected to a gas supply pipe behind the plate. The projecting parts of the bunsens are in the form of balls with perforations in every direction, so that gas issuing from all the perforations forms, when lit, a ball of blue flame. Any other shape of burner that will sufficiently spread the flame in all directions may be substituted. The correct air and gas mixture is defined by introducing and controlling the admission of air into the gas supply pipe at a position outside the stove proper, the mixing and control devices being of any known type. 75

Over each burner is placed a hollow radiant cap which is also moulded from a radiant fireclay mixture capable of giving the highest degree of radiance. Each cap is moulded, shaped and coloured to represent a cob or block of coal, and is so designed that when the hollow cap is in position over a hot bunsen burner of the form hereinbefore described it will be 80

come incandescent, and its sidewalls will be red and semi-transparent representing hot glowing burning coal and its upper part will be colored black representing the 5 still unburnt part of the coal block. This incandescent state is caused by the bunsen flames impinging upon the inner walls of the hollow cap. This part of the invention is hereinafter termed "the coal 10 block."

Several such coal blocks are used to form a fire, and each is placed upon the radiant plate with its open end downwards, thus covering and enclosing the 15 bunsen burner and its flames.

Each coal block is held in position upon the radiant plate by ears or prongs which project from the surface of the radiant plate into the interior of the coal 20 block. Any equivalent arrangement for supporting the coal block on the radiant plate may be substituted, for example prongs on the block may fit into corresponding holes in the plate. Or the lower 25 end of the block may itself fit into a hole or recess in the plate. Or hooked shaped lugs may be provided on either or both of the parts to hold the coal-block and radiant plate together.

30 Notoches or holes are formed in the lower part of the walls of the coal-block to allow light and heat to be thrown or reflected outwardly on to the surface of the radiant block thus increasing the 35 luminosity of the reflection from its surface.

In an alternative construction the coal-block and the radiant plate may be moulded in one self-contained piece or 40 unit with apertures in the plate large enough to enable the bunsen ball to pass through. This construction is not preferred so much as the separate construction hereinbefore described.

45 The coal blocks forming one fire are made of different shapes and sizes to produce the irregular appearance that any coal fire would have. The radiant block is also moulded with such irregular 50 surface shape that it forms what looks like the small pieces of coal that would form the bottom portion of any ordinary coal fire. When the two parts—the coal blocks and the radiant block—are correctly 55 assembled in their proper relative positions and rendered incandescent, the whole will have the appearance and will give out the radiant heat closely resembling an ordinary fire built up of coal when it has 60 got red hot and is partly burnt away.

The radiant plate and its coal blocks are so mounted relatively to the fireback that light and heat escaping from the rear of each coal block and burner is thrown on 65 to the fireback, so that in due course the

fireback also becomes incandescent, thus reflecting a large amount of heat into the room and in directions controlled by the shape of the fireback. The whole apparatus when burning presents a complete glowing furnace of radiant heat with coal-fire appearance.

Owing to the intense heat generated inside the coal blocks and upon the radiant plate surface the consumption of gas is so perfect that there are no fumes arising from products of combustion usual in ordinary gas fires, and therefore the usual chimney outlet is not necessary although it can be provided if desired.

The coal blocks are so shaped on their inner hollow surfaces as to extract the utmost heating value from the gas consumed. It is therefore preferred to form their inner walls with a number of studs which project inward and are impinged upon by the flames. To further this result a cone shaped block may project inwardly and downwardly from the top or roof of the hollow coal block, and because of its mass considerably augment the heating value of the block. The hollow block may be inwardly strengthened by cross ribs which connect opposite walls together and also are impinged upon by the flames. Any forms of studs, cross rails, or the like used in some known shapes of radiants for ordinary gas fires may be used inside these coal blocks.

Sufficient openings are provided for the 100 free access of air to supply oxygen and for free outlet of heat products all round and about the respective parts.

The parts when assembled fit sufficiently loosely to allow for expansion of 105 the coal blocks relatively to expansion of the studs or parts of the radiant plate that supports them.

The several burners are all ignited by a swinging pilot light which is first 110 ignited where its jet comes to one side of the stove; it is then moved across to the opposite side, igniting all the burners in its path.

A stove constructed according to this 115 invention may be used with any kind of gaseous or vapour fuel, such as coal-gas, paraffin-gas, petrol-gas, acetylene-gas, alcohol, benzole, or the like.

The construction of the stove herein 120 described provides a heating apparatus of the double purpose type, in that it is of convection type which warms and delivers to the room a stream of fresh air that is warmed in passing through the rear heating flue, and is also of the radiant heat type as it throws forward into the room an immense amount of radiant heat produced by gas flames impinging upon the interior of imitation coal blocks made in- 125 130

candescence internally, and by heat reflected from the radiant plate and from the fireback both of which are also rendered incandescent by the same means.

Dated this 1st day of December, 1933.  
J. OWDEN O'BRIEN AND SON,  
Late W. P. Thompson & Co.,  
of Manchester,  
Patent Agents.

### COMPLETE SPECIFICATION

#### Improvements in Stoves or Heating Apparatus

5 I, JOHN EDWARD THORNTON of 8, Hill Street, Jersey, Channel Isles, a British Subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an improved form of fire employing gaseous fuel as the source of heat and simulating a coal fire

15 It has been proposed in the prior specification No. 284,867 to construct a gas fire with hollow fire clay radiants resembling pieces of coal and having apertures 20 for the escape of flames supported by a bed of fireclay material at the rear of which an inclined wall also of fireclay material is arranged, the heat being produced by a series of bunsen burners which 25 project through the fireclay bed to the bottom of the radiants and luminous and lambent flames being also produced by a second series of burners supplied with gas unadmixed with air. It is stated in the 30 specification that by such construction of fire the radiation therefrom is largely rays from the red spectral region which will penetrate into the blood stream below the tissues of the skin of a human being.

The present invention generates waves confined largely to the infra-red region of the spectrum, and does not employ any luminous and lambent flames nor two 40 different kinds of burners as in that specification but only the one kind which is non-luminous.

Furthermore, the present invention is designed to produce the closest possible 45 visual resemblance to a coal fire built up from detachable hollow blocks or shells of refractory material of various sizes and various irregular shapes which are moulded and colored to resemble blocks 50 of coal; and the heat therefor is supplied by bunsen burners only, which produce great heat from blue (non-luminous) flames and render the whole of the refractory material of the fire, including the 55 imitation coal shells, the irregular base or fire bottom and the vertical wall behind the fire, intensely hot and incandescent-red by waves confined largely to the

infra-red region of the spectrum which is commonly used in most gas stoves of the well-known standard type. 60

The means by which is obtained the visual effect resembling a glowing mass of burning coal comprises the use of several parts consisting of refractory material of different form and construction which are used in combination and in the particular manner hereinafter described. These are all brought to a very high degree of incandescent-red by gaseous fluids burnt with suitable admixture of air at the nozzles of suitable bunsen burners, which burners are projected into the interior of hollow blocks of refractory material moulded shaped and colored to represent blocks of coal in various stages of combustion, partly burnt and partly unburnt; and in combination therewith the means further comprises openings in the rear walls of these coal blocks from which portions of the blue flames escape and impinge upon the vertical wall of a very thick and heavy radiant block of refractory material which forms a rear wall of the apparatus and is forwardly inclined towards the apartment to be warmed; refractory material placed below such coal blocks and upon which their open lower ends are supported, the upper surface of the bed being of irregular shape and formation to form a continuation of the coal blocks and to resemble the lower part or bed of a hot glowing fire; and finally, suitable gas-emission apertures in the burners which are so placed that they throw blue flames through the coal block openings, from the rear openings on to the rear vertical wall and from the lower openings on to the horizontal bed. 70

The fire according to the invention thus comprises in its construction a bed composed of a thick block or blocks of refractory material preferably having its upper surface moulded or shaped to represent the small coal of a fire-bed; wall at the rear of the fire-bed of thick refractory material, said wall projecting vertically upwards from the fire-bed and at its upper part extending forwardly over the bed 105 at an angle of less than 90° thereto; a plurality of detachable hollow fire shells 110

formed of refractory material shaped and colored to represent pieces of coal in different stages of combustion, said fire shells being supported by the fire-bed; 5 and a series of blue flame bunsen burners arranged to project into the hollow fire shells; each fire shell being formed with an opening or openings at the rear to allow part of the flames from the burner 10 to impinge laterally on to the vertical part of the rear wall, and with or without an opening in its lower part to allow part of the flames from the burner to be projected downwardly upon the fire bed 15 the whole of the parts comprising the fire-bed block or blocks, the vertical rear wall and the interior of the fireshells being thus raised to an incandescent red heat by the blue flames from the bunsen 20 burners to form one combined unit or furnace of glowing red radiant heat.

As a result of this particular structure and combination of parts and details, the intense heat of the bunsen blue-flames 25 raises the interior of each coal block to a condition of red-incandescence, and the rear wall and horizontal bed are likewise raised to a similar condition of red-incandescence. The adjacent proximity of the 30 respective parts of the combination causes the heat of one to help the other so that they combine to form one furnace.

The invention will be described with reference to the accompanying drawings:—

Fig. 1. Perspective view of one form of hollow fuel member A.

Fig. 2 and 3. Vertical and horizontal sections of same.

40 Figs. 4 and 5. Vertical and horizontal sections of a modification.

Fig. 6. Sectional elevation of a further modification.

Fig. 7. Plan of base block B.

45 Fig. 8. Side elevation of same.

Fig. 9. Transverse section on line 9—9

Fig. 7.

Fig. 10. Vertical section of a double fuel block A1.

50 Fig. 11. Rear elevation of fuel block and base block cast in one.

Fig. 12. Plan of modified base block B.

Fig. 13. Side elevation thereof.

55 Fig. 14. Vertical section showing the base block and fuel blocks assembled in a stove.

Fig. 15. Front elevation of same.

Figs. 16, 17 and 18. Vertical sections of further modifications of the assembled 60 stove.

Fig. 19. Detail view of various forms of burners.

The fire comprises three main parts. (a) a radiant base block B forming the fire 65 bed, (b) a plurality of hollow radiant fuel

members or shells A representing blocks of coal, and (c) a series of bunsen or other type burners C which pass through openings in the base block and project into the hollow radiant fuel shells A.

The base block B is formed of firebrick or fireclay of the type which will produce the highest degree of radiance, and may be in the form of a thick plate the full width and depth of the fire recess (Figs. 7 to 9), or it may be constructed in sections (Figs. 12 and 13) connected together by a tongue and groove b or with overlapping rabeted joints. It is moulded with a very irregular top surface to resemble the bottom or inner part of a coal fire that has partly burnt away, and may be supported at the back upon a cast metal backing to give added strength and support, or it may be of sufficient strength alone to require no such backing. It may be completely solid, or it may be hollow with several rear cavities. It is preferably made of considerable thickness to ensure a very high degree of red incandescence. Three inches is a suitable thickness, but it may be thicker.

This fire bed forms the bottom of the apparatus equivalent to the bottom of a coal grate.

A series of burners C project through a plurality of apertures b1 in the base block B; gas being supplied to the burners by supply pipes c connected to a main supply pipe c1 behind the block.

The burners C may be of any of the forms shown in Fig. 19, either in the form of a ball c3 with perforations c4 so that gas issuing from the perforations forms when ignited a ball of blue flame, 105 or it may be of mushroom form c5 provided with an adjusting screw c6, or in the form of a tube c7 having perforations c8. Any other shape of burner that will sufficiently spread the flame in all directions may be substituted. The correct air and gas mixture is defined by introducing and controlling the admission of air into the gas supply pipe at a position outside the stove proper, the mixing and control devices being of any known type.

Owing to the very high temperature of the fire the burners and their pipes and fittings require to be made of metal capable of resisting a high temperature, such as chrome-steel or the like, or of some refractory clay material or composition, or of the two materials in combination.

Over each burner C is placed a hollow radiant member, in the form of a cap or shell A which is also moulded from a radiant fireclay mixture capable of giving the highest degree of radiance. Each shell A is moulded shaped and colored to represent a cob or block of coal, and is so 130

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- designed that when the hollow shell is in position over the hot bunsen burner C of the form hereinbefore described it will become incandescent, and its sidewalls 5 will be red and semi-transparent representing hot glowing burning coal, and its upper part will be colored black representing the unburnt part of the coal block. This incandescent state is caused by the bunsen flames impinging upon the inner walls of the hollow shell. This shell 10 A is hereinafter termed "the coal block." Several such shells A, preferably of different irregular shapes and sizes, are used to form a fire, and each is placed upon the radiant base block B with its open end downwards, thus covering and enclosing the bunsen burner C and its 15 flames.
- Each shell A is loosely held in position upon the radiant base block B in any suitable way. In one method the coal block is provided with a lower extension or 20 hollow shank which fits into a corresponding hole b1 in the radiant base block B. In another method a hollow shank b2 Fig. 16 forming part of the radiant base block B projects into the hollow coal block A. Any equivalent arrangement for 25 supporting and interlocking, the shells A on the block B may be substituted.
- Apertures or holes a1 may be formed in the lower part of the walls of the coal-block A as shown in Figs 4 and 6 to 30 allow light and heat to be thrown or reflected outwardly on to the surface of the radiant block B, to increase the reflection from its surface.
- In an alternative construction the shells A and the radiant block B may be moulded in one self-contained piece or unit with apertures in the block large enough to enable the bunsen ball to pass through, Fig. 10 and 11. This construction is not preferred so much as the separate construction hereinbefore described.
- The shells A forming one fire are made of different shapes and sizes to produce the irregular appearance that any coal 40 fire would have. The radiant block B is also moulded with such irregular surface shape that it forms what looks like the small pieces of glowing coal that would form the bottom portion of any ordinary coal fire. When the two parts (the radiant base block and the superimposed shells A) are correctly assembled in their proper 45 relative positions, and rendered incandescent, the whole will have the appearance of an ordinary coal fire when it has become red hot and partly burnt away and will also give out intense radiant heat.
- Each shell A is constructed with an aperture a2 at the rear through which the 50 products of combustion escape from the interior together with some of the heat radiated directly from the flame and burner C. The interior of the shells A may be formed with a plurality of projections or studs a3 and/or with cross members a4 to assist in the radiation of the heat therefrom.
- Behind the radiant base block B and the shells A is mounted a rear wall D of refractory material on to which light and heat escaping through the aperture a2 in the rear of each shell are thrown so that in due course the wall D also becomes incandescent, thus reflecting a large amount of heat into the room and in directions controlled by the shape of the fireback. The lower part of the wall D is vertical and its upper part is inclined over the top of the shells A. The whole apparatus when burning presents a complete glowing furnace of radiant heat with coal-fire 55 appearance.
- Owing to the intense heat generated inside the shells and upon the radiant base block surface, the consumption of gas is so perfect that there are no fumes arising as products of combustion, such as are common in ordinary gas fires; therefore the usual chimney outlet is not actually necessary, although it is preferably provided for ventilation purposes.
- The hollow shells A are so shaped on their interior surfaces as to extract the utmost heating value from the gas consumed, for which purpose projections or 60 studs a3 are formed thereon. To further this result a cone shaped block a5 may project inwardly and downwardly from the top or roof of the hollow shell, which, because of its mass, will considerably augment the heating value of the block. The hollow shell may be inwardly strengthened by cross ribs a4 which connect opposite walls together and are also impinged upon by the flames. Any forms of studs, cross rails, or the like, used in 65 some known shapes of radiants for ordinary gas fires, may be used inside these shells.
- Sufficient openings are provided for free access of air to supply oxygen and for free outlet of heat products all round and about the respective parts.
- The parts when assembled fit sufficiently loosely to allow for relative expansions of the coal blocks and the radiant base block that supports them.
- The wall D of refractory material may be constructed with an outlet flue or pipe D' for the escape of any products of combustion and it may also be provided at the rear with a ventilating flue D'' as shown in Fig. 18. Alternatively as shown in Fig. 16 the rear wall D may be hollow to form a combustion chamber D' into 70
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which additional heating burner or burners C project by which additional heat is supplied to the wall.

The rear wall D may be provided with 5 sidewings and moulded in such shape that it forms either a curved concave recess or one with straight bevelled sides and is forwardly inclined at its upper part.

The entire fireback structure may be 10 lifted clear of the hearth by feet or runners, or it may rest directly upon the hearth, or may be so built that it becomes part of the hearthplate itself, and may be combined with a hearth of the sunken or 15 well type.

The fireback structure may be built directly into the chimney recess of an ordinary fireplace, or it may be built into a metal casing or carrier frame which 20 allows it to be placed in such recess or other suitable position.

A stove constructed according to this invention may be used with any kind of gaseous or vapour fuel, such as coal-gas, 25 paraffin-gas, petrol-gas, acetylene-gas, alcohol, benzole, or the like.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to 30 be performed, I declare that what I claim is:—

1. A fire employing gaseous fuel as the source of heat and simulating a coal fire in appearance comprising in its construction, a bed composed of a thick block or blocks of refractory material preferably having its upper surface moulded or shaped to represent the small coal of a fire-bed; a wall at the rear of the fire-bed 35 of thick refractory material, said wall projecting vertically upwards from the fire-bed and at its upper part extending forwardly over the bed at an angle of less than 90° thereto; a plurality of detachable hollow fire shells formed of refractory material shaped and colored to represent pieces of coal in different stages of combustion, said fire shells being supported by the fire-bed; and a series of blue 40 flame bunsen burners arranged to project into the hollow fire shells; each fire shell being formed with an opening or openings at the rear to allow part of the flames from the burner to impinge laterally on to the vertical part of the rear wall, and with or without an opening in its lower part to allow part of the flames of the burner to impinge downwardly 45 upon the fire bed, the whole of the parts 50 comprising the fire-bed block or blocks, the vertical rear wall and the interior of the fireshells being thus raised to an incandescent red heat by the blue flames 55 from the bunsen burners to form one combined unit or furnace of glowing red 60

radiant heat.

2. A fire employing gaseous fuel as the source of heat as in claim 1 in which the block or blocks forming the fire-bed, the fireshells, the rear wall or reflector and the burners are carried by a supporting frame of metal, brick or tiles, the whole forming one complete fire unit. 70

3. A fire employing gaseous fuel as the source of heat as in claim 1 or 2 but modified in that the radiant base-block and the hollow fuel member are amalgamated as one moulded block in which the coal blocks stand above but are part of the lower baseblock and are hollow to house 75 the burners.

4. A fire employing gaseous fuel as the source of heat as in claim 1 or 2 having the baseblock forming the firebrick made in two or more sections connected together by a tongue on one section entering a groove on an adjacent section, or by overlapping rabeted ends on each section. 80

5. A fire employing gaseous fuel as the source of heat as in claim 1 or 2 having the block or blocks forming the firebed provided with means for carrying, holding, engaging with, or interlocking with the hollow fireshells and with means for passing gas and air through the block or blocks to the interior of the fireshells. 90

6. A fire employing gaseous fuel as the source of heat as in claim 1 or 2 in which the radiant hollow fuel blocks or fire shells 100 are each of different size and shape to represent a separate block of coal or other fuel, and constructed with means for loosely engaging with or interlocking with the baseblock in such manner as to allow free expansion or contraction of the respective parts and with a passage 105 through which the bunsen burners project into their interior.

7. Hollow blocks of refractory material 110 forming imitation coal for use in the fire claimed in claim 1 or 2 said blocks being moulded shaped and colored to represent pieces of coal of various shapes and sizes and provided on the interior with projecting studs or cross bars to project into the path of the blue flame of the bunsen burner. 115

8. A fire employing gaseous fuel as the source of heat as in claim 1 or 2 having 120 an air flue behind the back plate for warming the air and delivering it to the room for ventilation purposes.

9. A fire employing gaseous fuel as the source of heat as in claims 1 or 2 in which 125 the back wall is provided with a flue or outlet for the passage of the products of combustion to the chimney.

10. A fire employing gaseous fuel as the source of heat as in claim 1 or 2 130

mounted on suitable feet or wheels to raise it above the level of the floor.

11. A fire employing gaseous fuel as in claim 1 or 2 in which the heat is produced by the combustion of oil-gas, petrol-gas, coal-gas, acetylene gas, alcohol, benzol or similar vapours.

12. A fire employing gaseous fuel as

the source of heat substantially as described with reference to the accompanying drawings.

Dated this 28th day of December, 1934.

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Leamington Spa : Printed for His Majesty's Stationery Office, by the Courier Press.—1935.